

Submission to CIM2010 Nature versus Culture

Music, Speech and Emotion: psycho-physiological and computational investigations

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1. Background in Music Cognition.

There is growing evidence that perception of emotion expressed in vocal prosody and in music shares certain psychoacoustic attributes (Juslin & Laukka 2003). From the perspective of musicology these findings are significant because they indicate that listeners' affective responses to music can be accounted for at least in part by "basic" acoustic cues.

2. Background in Computer Science.

Previous research has shown that a large part of listeners' affective response to music can be predicted from a small set of psychoacoustic cues (Coutinho & Cangelosi, 2009), and physiological variables (Coutinho & Cangelosi, *in press*).

3. Aims

Our goal is to better understand the way people perceive emotion in music and speech prosody, i.e. the way people infer the emotional state of others from nonverbal aspects of speech.

4. Main Contribution

The method involves asking participants to listen to a set of music pieces and speech excerpts, while reporting their emotional experience using a computer framework interfaced with a device that controls the movement of the cursor or pointer on a display screen. At the same time we measure participants' physiological reactions during listening, namely heart rate, skin conductance, respiration and blood volume pressure. The data collected from the mouse position and the physiological readings is used to analyze the participants' psychological and physiological reactions to the stimuli and to compare them with the psychoacoustic properties of the music and speech. Each participant also completes a set of short questionnaires that gather relevant personal information, such as age and gender (and other demographic variables), exposure to music, years of musical training, personality traits and mood state. This information is used to test various sub-hypotheses about the factors influencing perception of emotion in music and speech prosody. This is the first time that an attempt has been made to study the relationship between expression of emotion in music and speech prosody in longer excerpts of music and speech.

5. Implications

Evidence that the perception of emotion conveyed by music and speech relies on shared psychoacoustic characteristics lends credence to the idea that, to some

extent at least, emotion perception relies on 'basic' attributes that are adaptive responses to environmental cues. This emphasises the role of the natural in emotional expression in music, contrary to the predominance of cultural (semiotic) models of musical expression. Furthermore, the identification of shared characteristics of emotion expression in music and speech prosody may contribute to evolutionary perspectives on music and language.

6. References

Coutinho, E., & Cangelosi, A. (2009). The use of spatio-temporal connectionist models in psychological studies of musical emotions. *Music Perception*, 27 (1), 1-15.

Coutinho, E., & Cangelosi, A. (in press). Musical emotions: predicting second-by-second subjective feelings of emotion from psychophysiological measurements. *Manuscript submitted for publication*.

Juslin, P., & Laukka, P. (2003). Communication of emotions in vocal expression and music performance: Different channels, same code? *Psychological Bulletin*, 129 (5), 770-814.

7. Biographies

Dr Eduardo Coutinho is a Postdoctoral Research Fellow at the University of Sheffield, and his research centres on investigating the relationships between the dynamics psychoacoustic features in music and speech and the communication of emotion. In 2008, he completed his doctorate in cognitive sciences at the University of Plymouth with a thesis on the effects of music in human emotions by means of psycho-physiological empirical experiments and computational models.

Dr Nicola Dibben is a Senior Lecturer in Music at the University of Sheffield, and has published over 25 papers and book chapters in musicology and music cognition. She has recently published two books: *Björk* (Equinox Press, 2009) and *Music and Mind in Everyday Life* (Oxford University Press, 2010).